**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**
**BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

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In re Patent Application of:

Shin SATO

Application No.: 10/791,829 Group Art Unit: 1753

Filed: March 4, 2004 Examiner: Arun S. Phasge

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**SECOND APPEAL AND**
**APPEAL BRIEF UNDER 37 CFR § 41.37**

Date: November 1, 2007

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This Appeal Brief is filed pursuant to 37 CFR § 41.37. Because this is the second Appeal Brief filed regarding this Application, no additional Appeal brief fee is required.

## REAL PARTY IN INTEREST

The real party in interest is Kurita Water Industries, LTD.

## RELATED APPEALS AND INTERFERENCES

Appellant, Appellant's representative, and the Assignee of this application are aware of no other appeals or interferences that will directly affect, or be directly affected by, or have a bearing on, the Board's decision in the pending appeal.

## STATUS OF CLAIMS

This is an appeal from the non-final rejection of claims 1-2 and 4-7 in the Office Action of August 23, 2007.

Claims 1-2 and 4-7 are pending in the application. Each of claims 1-2 and 4-7 stands rejected. Claim 3 was canceled in the After Final response to the Final Office Action issued September 21, 2006.

The rejection of each of claims 1-2 and 4-7 is appealed and is set forth in their entirety in the Claims Appendix attached hereto.

## STATUS OF AMENDMENTS

Each of the claim amendments presented in Appellant's Amendment filed January 27, 2007 has been entered.

## SUMMARY OF CLAIMED SUBJECT MATTER

As disclosed in paragraph [0021] of the specification and as illustrated in Fig. 1, the Appellant's electrodeionization apparatus comprises:

> "a plurality of anion-exchange membranes (A membranes) 13 and a plurality of cation-exchange membranes (C membranes) 14 which are alternately arranged between the electrodes (anode 11, cathode 12), concentrating

compartments 15, and desalting compartments 16. The concentrating compartments 15 and the desalting compartments 16 are each defined between the membranes 13 and 14 and are therefore alternately arranged between the electrodes. The desalting compartments 16 are filled with anion-exchanger and cation-exchanger made of ion exchange resin, ion exchange fibers, or graft exchanger. In the desalting compartments 16, the anion-exchanger and cation-exchanger are filled in the mixed state or multiple-layered state."

Furthermore, paragraph [0022] discloses wherein:
"the concentrating compartments 15, anolyte compartment 17, and catholyte compartment 18 are filled with electric conductive media such as ion exchanger, activated carbon, or metal. The concentrating compartments, in particular, are filled with the anion exchanger and the cation exchanger in such a manner that the mixing ratio (volume ratio) of the anion exchanger to the cation exchanger (anion exchanger/cation exchanger) becomes 8/2 to 5/5."

In addition, paragraph [0024] discloses wherein:
"[w]hen at least one part of the anion exchanger is made of a II type anion exchange resin, the rate of removal of carbonate ions is improved. The II type anion exchange resin is strongly basic anion exchange resin including dimethyl ethanolamine as a functional group. The mixing ratio of the II type anion exchange resin is desirably about 5 to 15% by volume of the anion exchanger."

Furthermore, paragraph [0054] discloses wherein:

"[r]aw water in the concentrating compartments is introduced into the desalting compartments through a raw water inlet line 41 and concentrated water is introduced into the concentrating compartments through a concentrated water inlet line 42. The raw water introduced into each desalting compartment flows through a layer filled with the ion-exchange resin whereby impurity ion in the raw water is removed so as to make the raw water to deionized water which flows out through a deionized water outlet line 43."

In addition, paragraph [0055] discloses wherein:
"[t]he concentrated water fed to the concentrating compartment captures impurity ions which pass through the ion exchange membranes 34, 36 while flowing down through the concentrating compartment, and flows out from a concentrated water outlet line 44. Electrode water is passed within electrode compartments through introducing lines 45, 46 and discharging lines 47, 48, respectively.

As shown in FIG. 3b and as disclosed in paragraph [0040]:
"a part of the product water flowed out of the desalting compartments is introduced into a circulatory system of the concentrated water flowing section 15B in which the circulation is conducted by a pump. The part of product water is thus circulated in the concentrated water flowing section 15B near the outlets for product water. A part of circulating concentrated water from the circulatory system is introduced into a circulatory system of the concentrated water flowing section 15A in which the circulation is conducted by a pump. The part of

circulating concentrated water is thus circulated in the concentrated water flowing section 15A near the inlets for raw water. A part of circulating concentrated water from the concentrated water flowing section 15A near the inlets for raw water is discharged out of the circulatory system."

Furthermore at paragraph [0051], the specification discloses wherein:

"[i]n the electrodeionization apparatus of Figs. 3a, 3b, after a part of product water enters into a circulatory system of the concentrated water flowing section 15B near the outlet for product water and is circulated therein, a part of circulated water from the concentrated water flowing section 15B enters into a circulatory system of the circulated water flowing section 15A near the inlet for raw water, is circulated therein, and is discharged out of the circulatory system. This means that concentrated water is flowed from the side of the outlets for product water to the side of the inlets for raw water and, after that, is partially discharged out of the circulatory system."

Furthermore at paragraph [0026], the specification discloses wherein:

"[b]y introducing product water into the concentrating compartments 15 in the single-pass counter-flow manner relative to the desalting compartments 16, the concentrated water in the concentrating compartment 15 near the outlets for product water has the lowest ion concentration, whereby the ion diffusion to the desalting compartments 16 due to the concentration

diffusion is restricted, and the ions are removed at a high rate. Especially, silica and boron ions are removed at an extremely high rate."

Accordingly, based upon the above disclosure, the apparatus for electrodeionization of water recited in claim 1 includes an anolyte compartment 17 having an anode 11, a catholyte compartment 18 having a cathode 12, concentrating compartments 15 and desalting compartments 16 wherein the concentrating compartments 15 and the desalting compartments 16 are formed between the anolyte compartment 17 and the catholyte compartment 18 by arranging alternately at least one anion-exchange membrane 13 and at least one cation-exchange membrane 14. Furthermore, the apparatus includes an ion-exchanger with which the desalting compartments 16 are filled, and at least one of ion-exchanger, activated carbon, and electric conductor which fills the concentrating compartments.

The apparatus further includes a device for introducing electrode water into the anolyte compartment 17 and the catholyte compartment 18, a concentrated water introducing device for introducing concentrated water into the concentrating compartments 15, a device for feeding raw water into the desalting compartments 16 to produce deionized water, and outlets formed at the desalting compartments for taking out the deionized water.

The outlets of the desalting compartments 16 are connected to the concentrated water introducing device to introduce a part of the deionized water containing at least one of silica and boron at a lower concentration than the raw water and obtained from the desalting compartments 16 into the concentrating compartments 15 at a side near the outlets for the deionized water of the desalting compartments 16.

The concentrated water introducing device makes the concentrated water flow out of the concentrating compartment at a side near an inlet for the raw water of the desalting compartment, and at least a part of the concentrated water flows out of the concentrating compartments out of a circulatory system.

Furthermore, the desalting compartments are filled with an anion exchanger and a cation exchanger in such a manner that anion exchanger/cation exchanger volume ratio becomes 8/2 to 5/5. Further still, at least one part of the anion exchanger in the desalting compartment is made of a II type anion exchanger.

**GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL**

Whether claims 1-6 (correctly, claims 1, 2 and 4-6) are unpatentable under 35 U.S.C. § 102(e) as being anticipated by, or in the alternative, under 35 U.S.C. § 103(a) as obvious over U.S. Patent No. 6,649,037 to Liang et al.,("Liang").

Whether claim 7 is unpatentable under 35 U.S.C. § 103(a) over Liang in view of U.S. Patent No. 5,292,422 to Liang et al. ("Liang '422").

**ARGUMENT**

1. Claim 1 is not anticipated under 35 U.S.C. § 102(e) over Liang

The Examiner asserts that Example 1 of Liang, starting at column 14 and illustrated in Fig. 1, discloses the claimed electrodeionization, "wherein the water from the outlet of the diluting compartment is fed to the inlet of a concentrating compartment." (*see* Office Action, page 2). A rejection based on 35 U.S.C. §102 requires every element of the claim to be included in the reference, either directly or inherently. Notwithstanding the assertions of the Examiner, the disclosure

of Liang fails to disclose, teach, or suggest all elements of the Appellant's claimed apparatus.

As recited in claim 1, the deionized water from the outlets of the desalting compartments is introduced to the concentrating compartment "at a side near the outlets for the deionized water of the desalting compartments." (Emphasis added)

Claim 1 further recites wherein "the concentrated water introducing device makes the concentrated water flow out of the concentrating compartment at a side near an inlet for the raw water of the desalting compartment." (Emphasis added). As a result of the specific structural arrangement recited in claim 1, silica and boron ions are removed at a high rate, as explained at paragraph [0026] of the specification.

Liang does not disclose, teach, or suggest this configuration of inlet and outlet devices.

Liang only appears to disclose, in Fig. 1, a two-stage system wherein water first passing through an anion exchange module 60 is then passed through a second module comprising mixed ion exchange material having a separate depletion department 30 and concentrating compartment 40. Unlike the device recited by the Applicant, Liang discloses wherein feed stream 50 feeds ion-depletion compartment 10 and ion-concentrating compartment 20, both compartments being in first module 60. Applicant's device differentiates from Liang in that, as illustrated in Applicant's Fig. 1 and as recited in claim 1, "outlets of the desalting compartments are connected to the concentrated water introducing device to introduce a part of the deionized water." Notwithstanding Liang illustrating first product being feed into depletion compartment 30 and concentration compartment 40, Appellant submits that both these compartments are in the second stage, not the first stage. Nowhere does Liang disclose wherein first product is fed into

the concentrating compartment of the first module 60. Indeed, as previously indicated, concentrating compartment 20 is only fed by the same feed as ion-depletion compartment 10.

Furthermore, nowhere does Liang disclose teach, or suggest wherein the outlet of the desalting compartment is on the same side as an inlet of the concentrating compartment or wherein the outlet of the concentrating compartment is near an inlet for the raw water of the desalting compartment. Indeed, Fig. 1 illustrates wherein an outlet on a bottom side of the ion-depletion compartment 10 feeds an inlet disposed on topside of a concentration compartment 40. Nowhere does Liang suggest wherein both inlet and outlet are disposed on the same side.

Therefore, because Liang does not suggest the interconnection of compartments as recited by the Appellant in claim 1, Appellant respectfully submits that Liang does not disclose, teach or suggest each and every limitation recited in claim 1. Accordingly, the rejection of claim 1 under 35 U.S.C. §102(e) over Liang is improper, and allowance of independent claim 1 is respectfully requested.

2. Claim 1 is not obvious under 35 U.S.C. § 103(a) over Liang

The Examiner asserts that the recited claims would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the disclosure of the Liang patent, because "given the disclosure of Liang one having ordinary skill in the art would find it predictable to select from the variety of different configurations based upon the material being treated and removed to obtain the purified liquid." (*See* first paragraph, page 3, of the Office Action). Appellant respectfully disagrees and submits that the Examiner has failed to establish prima facie obviousness.

The USPTO's Board of Patent Appeals and Interferences has stated that:

> "[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." (In re Kahn, 441 F. 3d 977, 988 (CA Fed. 2006) cited with approval in *KSR INTERNATIONAL CO. v. TELEFLEX INC.*, 550 U.S. 14 (2007)).

As presented above in rebutting the anticipation rejection of claim 1 over Liang, nowhere in any of the figures illustrating various configurations, or the accompanying text, does Liang disclose teach, or suggest wherein a part of the deionized water is introduced into the concentrating compartment. Neither does Liang disclose wherein the outlet of the desalting compartment is on the same side as an inlet of the concentrating compartment, nor wherein the outlet of the concentrating compartment is near an inlet for the raw water of the desalting compartment.

Applicant submits that the Examiner's has failed to establish the necessary step of explaining why, if all the examples disclosed by Liang fail to disclose, teach, or suggest, the Applicant's method, would it be "predictable" for one of ordinary skill in the art to combine these dissimilar configurations in a manner to be sufficient to have made the claimed invention. Because the examples are dissimilar to that of the Appellant, and because the Examiner provides only conclusory statements, the rejection under 35 U.S.C. 103(a) is invalid. Accordingly, because claim 1 is neither anticipated by, nor rendered obvious by Liang, allowance of claim 1 is respectfully requested.

3. Claims 2 and 4-6 are neither anticipated under 35 U.S.C. § 102(e) by, or rendered obvious under 35 U.S.C. § 103(a), over Liang

Claims 2 and 4-6 depend variously from claim 1 and are likewise patentable over Liang at least based upon their dependence on an allowable base claim, as well as for the additional features they recite. Accordingly, allowance of claims 2-6 is respectfully requested.

4. Claim 7 is patentable under 35 U.S.C. § 103(a) over Liang

On page 3 of the final Office Action, the Examiner acknowledges that Liang fails to disclose the use of tie rod as conventional in the assembly of electrodeionization cells and relies upon Liang '422 to remedy the deficiencies of Liang.

Notwithstanding any disclosure Liang '422 regarding the use of a tie rod, Liang '422 fails to remedy the deficiency of Liang in regards to either the 102 or 103 rejections, as submitted above. Specifically, Liang '422 fails to disclose, teach or suggest the arrangement of inlets and outlets as recited in claim 1. Therefore, the combination of Liang and Liang '442 fails to disclose, teach, or suggest all of Appellant's claim limitations.

Accordingly, it is respectfully submitted that claim 7 is likewise patentable over the applied art for at least its dependence on claim 1, an allowable base claim, as well as for the additional features it recites.

**CONCLUSION**

Accordingly, Appellant respectfully submits that the rejections of claims 1-2 and 4-7 are in error, and request that each of the final rejections be reversed.

Respectfully submitted,

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## CLAIMS APPENDIX

1. An electrodeionization apparatus comprising:

an anolyte compartment having an anode;

a catholyte compartment having a cathode;

concentrating compartments and desalting compartments wherein the concentrating compartments and the desalting compartments are formed between the anolyte compartment and the catholyte compartment by arranging alternately at least one anion-exchange membrane and at least one cation-exchange membrane;

ion-exchanger with which the desalting compartments are filled;

at least one of ion-exchanger, activated carbon, and electric conductor which fills the concentrating compartments;

a device for introducing electrode water into the anolyte compartment and the catholyte compartment, respectively;

a concentrated water introducing device for introducing concentrated water into the concentrating compartments;

a device for feeding raw water into the desalting compartments to produce deionized water; and

outlets formed at the desalting compartments for taking out the deionized water;

wherein the outlets of the desalting compartments are connected to the concentrated water introducing device to introduce a part of the deionized water containing at least one of silica and boron at a lower concentration than the raw water and obtained from the desalting compartments into the concentrating compartments at a side near the outlets for the deionized water of the desalting compartments;

the concentrated water introducing device makes the concentrated water flow out of the concentrating compartment at

a side near an inlet for the raw water of the desalting compartment;

at least a part of the concentrated water flows out of the concentrating compartments out of a circulatory system;

the desalting compartments are filled with an anion exchanger and a cation exchanger in such a manner that anion exchanger/cation exchanger volume ratio becomes 8/2 to 5/5; and

at least one part of the anion exchanger in the desalting compartment is made of a II type anion exchanger.

2. An electrodeionization apparatus as claimed in claim 1, wherein the concentrating compartments are filled with the ion exchanger,

wherein the ion exchanger consists of an anion exchanger and a cation exchanger, and the anion exchanger and the cation exchanger are packed in the concentrating compartments in such a manner that the anion exchanger/cation exchanger volume ratio becomes 8/2 to 5/5.

4. An electrodeionization apparatus as claimed in claim 1, wherein 5 to 15% by volume of the anion exchanger consists of the II type anion exchanger.

5. An electrodeionization apparatus as claimed in claim 1, wherein the ratio of the anion exchanger becomes higher in a nearer position to the inlet for raw water in the desalting compartments.

6. An electrodeionization apparatus as claimed in claim 1, wherein the ion exchanger is a salt type ion exchanger before the electrodeionization apparatus starts to run and is filled in

each compartment in such a manner that volume of the salt type ion exchanger occupies 95 to 100% of each compartment.

7. An electrodeionization apparatus as claimed in claim 1, wherein

end plates are disposed on outermost both end sides out of the cathode or from the cathode to the anode respectively,

the end plates are tied together with tie-rods at the peripheries thereof, and

reinforcing members are disposed along at least one lateral side of the electrodeionization apparatus.

## EVIDENCE APPENDIX

No copies of evidence are appended hereto.

## RELATED PROCEEDINGS APPENDIX

No copies of decisions are appended hereto.